

HEAT PUMP WATER HEATER TECHNOLOGY

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WHAT IS A HPWH ?

- HPWHs USE A REFRIGERATION CYCLE TO MOVE & UPGRADE THE TEMP. OF HEAT FROM A LOW TEMP. SOURCE TO HEAT WATER
- WE ONLY PAY FOR THE ENERGY TO MOVE THE HEAT, NOT THE MOVED HEAT, SO HAVE APPARENT HIGH EFFICIENCY AND LOW ENERGY USE

WHY HPWH ?

- HPWH ARE 200-600% EFFICIENT
- HPWH HAVE LOWER OPERATING COSTS THAN ALMOST ALL ALTERNATIVES
- HPWH CAN PROVIDE FREE COOLING/DEHUMIDIFICATION AND/OR AIR AND WATER MOVEMENT (E.G. VENTILLATION, WATER CIRCULATION)

HPWH TYPES

- VAPOR COMPRESSION – MOST COMMON
- TRANSCRITICAL (CO₂) USE GROWING IN JAPAN
- AIR SOURCE MOST COMMON
- WATER SOURCE ALSO COMMON
- SOME GROUND SOURCE

HPWH HEAT SOURCES

- LOCAL AIR
- EXHAUST AIR
- WATER LOOP
- COOLING TOWER LOOP
- LAKE, STREAM, WELL
- REFRIGERATION WASTE HEAT
- SOLAR
- WASTE EFFLUENT STREAM
- MANY OTHERS

HPWH USES

- POTABLE WATER HEATING
- POOL & SPA HEATING
- COOKING & CLEANING
- LAUNDRY
- INDUSTRIAL PROCESSES
- ENGINE BLOCK HEATING (E.G. STANDBY GENERATORS)
- BEST APPLICATIONS USE THE COOLING

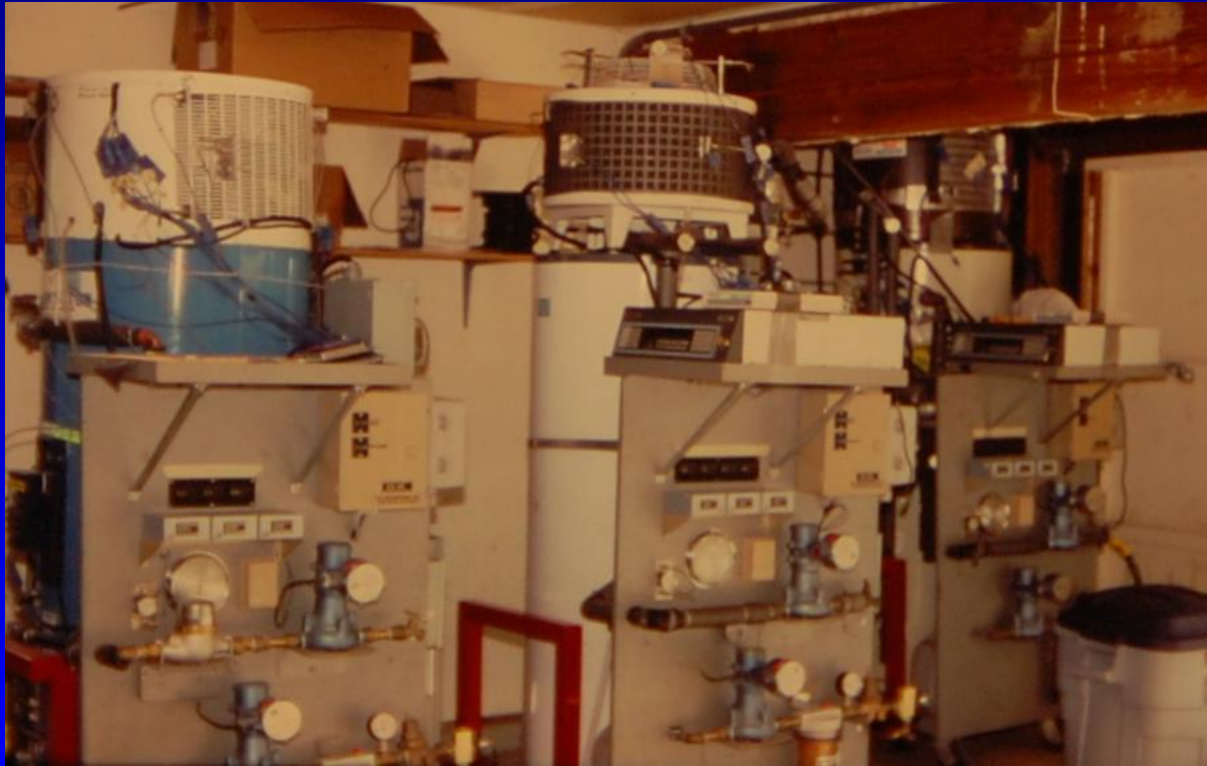
HPWH USES

- RESIDENTIAL
- COMMERCIAL
- INDUSTRIAL

HISTORY OF US HPWHS

- FIRST APPEARED IN SIGNIFICANT NUMBERS IN MID 1970s IN THE US
 - OIL EMBARGO
 - ENERGY AWARENESS
- AT LEAST 12 BRANDS OF HPWHS IN THE US IN LATE 1970s EARLY 1980s
 - MOST MAJOR AIR COND. MFGS.
 - MOST MAJOR WH MFGS.

EARLY HPWS UNDER LAB TEST



HISTORY OF US HPWHs (cont.)

- EARLY HPWHs HAD POOR RELIABILITY
- MOST REMOVED FROM MARKET
- REPEATED CYCLES OF HPWH INTEREST, RUSH TO MARKET, FAIL, REMOVAL

HISTORY OF US HPWHs (cont.)

- COMMERCIAL HPWHs HAVE FARED BETTER THAN RESIDENTIAL (BUT STILL LOW SALES NUMBERS)
 - BETTER COST EFFECTIVENESS
 - MORE SELF DIAGNOSTICS & PROTECTION
 - MORE ESTABLISHED MAINTENANCE INFRASTRUCTURE
- OVERSIZING COMMON MISTAKE IN COM'L

HISTORY OF US RESIDENTIAL HPWHs

- DESIGN FLAWS/POOR STRATEGIES
- POOR CONTROL STRATEGIES
- FAILURE TO UNDERSTAND GALVANIC CORROSION ISSUES
- POOR COMPONENT SELECTION
- POOR QUALITY CONTROL
- INADEQUATE SELF PROTECTION DEVICES

HISTORY OF US RESIDENTIAL HPWHs (cont.)

- INADEQUATE LAB TESTING
- INADEQUATE FIELD TESTING
- RUSH TO MARKET
- POOR INFRASTRUCTURE
 - SALES
 - APPLICATION
 - INSTALLATION
 - MAINTENANCE

HISTORY OF US RESIDENTIAL HPWHs (cont.)

- LACK OF MANAGEMENT COMMITMENT
- LACK OF WARRANTY COST PLANNING

US HPWH SALES VS MARKET POTENTIAL

- RESIDENTIAL WH SALES 8-10 MILLION UNITS/YEAR
- RESIDENTIAL HPWH SALES < 1000/YR
- COM'L HPWH SALES ALSO SMALL
 - POOL HEATING LARGEST MARKET SO FAR

HPWHs – WORLD WIDE

- HUGE COMMITMENT TO ECO-CUTE (CO₂) HPWHs IN JAPAN
 - >500,000 UNITS/YEAR BEING SOLD\
 - ELEC.UTIL & GOV'T SUBSIDIES
 - HIGH ENERGY PRICES
- OVER 30 HPWH BRANDS MADE IN CHINA
- NUMEROUS TYPES & BRANDS IN EUROPE, ASIA, AUSTRALIA

RESIDENTIAL HPWHs TODAY

- FOUR –SIX NEW BRANDS RECENT TO U.S. MARKET
 - GE
 - A.O. SMITH
 - RHEEM
 - AIR TAP
 - STEIBEL ELTRON
- PLUS NUMEROUS WATER-SOURCE HPWHs AND POOL HEATERS

NEW RESIDENTIAL HPWHS



RHEEM



A.O. SMITH



GE



STIEBEL
ELTRON



AIRTAP

CURRENT US RESIDENTIAL HPWH STATUS

- UTILITY & GOV'T TESTING UNDER WAY
- MOST UNITS AVAILABLE THROUGH BIG-BOX STORES (BUT MUST ORDER ?)
- ARE THEY RELIABLE ?
- ARE INFRASTRUCTURES IN PLACE ?
- HAVE THEY BEEN RUSHED TO MARKET ?
- IS THERE REAL CORPORATE COMMITMENT THIS TIME ????

SUMMARY

- IT IS CLEARLY POSSIBLE TO MAKE RELIABLE HIGH PERFORMANCE HPWHs
- TIME WILL TELL IF WE ARE THERE YET

